HARD WORKING SOLUTIONS

prologic CONTROLS

PLC-2450

REVISION 1.3

POWER SUPPLY/BATTERY CHARGER

USER MANUAL

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SAFETY FIRST

CAUTION! Please read before using your power supply

All electrical installations must meet local and national wiring codes and should be performed by qualified electricians.

Power supply disassembly or repair should be carried out by qualified technicians. Incorrect reassembly or repairs may cause electric shocks or fires, which could result in personal injury and/or property damage.

Ensure the use of properly rated fuses, as shown in the specifications and drawings.

Do not expose the power supply to rain, snow, or water spray.

Standalone Unit Safety

All PLC2450 Power systems use at least one PLC2450 standalone unit as the basic building block. For systems consisting of more than the standalone unit shown below in fig. 1, this manual is meant to be used in conjunction with system-specific drawings.

Fig. 1: PLC2450 Standalone Unit

120 Volt AC Power

Standalone unit AC power should be 3 wire, single phase, 120VAC, 60 HZ, 20 amp power, and should use #12 AWG or larger wire, with proper power, neutral, and ground connections.

Make sure AC Power is switched off before connecting any device to the power supply.

27.6 V DC Output connections (Battery and Load)

All DC connections for each standalone unit need to be sized to carry 50 amps, which is a minimum #2 AWG wire size.

Always ensure that the positive and negative output connections are secure and the screws are tightened properly. Loose connections can result in excessive voltage drops and may cause overheated wires and melted insulation.

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OPERATION

Standalone Unit Features

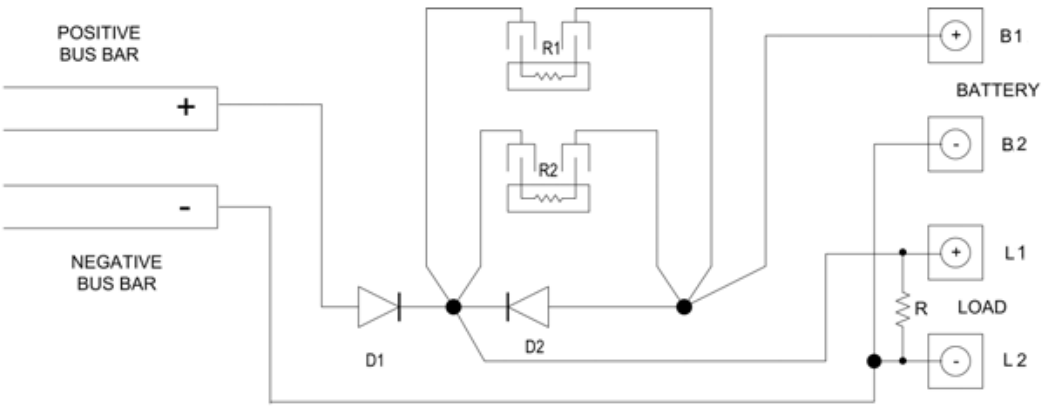
DC Power Supply

The power supply converts 120 V, 60 HZ. AC power into tightly regulated 27.6 V DC, +/- 1% delivering up to a maximum of 50 A continuous, (up to 55 A surge) with 5 base level PCB modules.

The unit is designed using advanced switch mode technology and load share circuitry for high reliability, high efficiency, and minimum size and weight. It is modular in construction consisting of 5 Base Level PCB modules (referred to as PSM “Power Supply Modules”) that are connected for parallel operation with true current sharing. Each module is a standalone power supply which delivers up to a maximum of 10 A continuous (11 A surge). By equalizing the output currents, uniform thermal stress of the individual modules is also ensured which has utmost importance for long term reliability for electronic components. The operating principle of the load share mechanism is to measure the output current of each individual module and to be able to modify the output voltage of the units until all the participating modules deliver equal output currents. Each module is required to be inter-connected with each other to a common “Share Bus” through a pair of parallel pins marked “JUMP 1” and jumper wires. Typically, the output currents for the paralleled units will be within 10% of each other at full output current.

DC Uninterruptable Power

With the addition of batteries to terminals B1 and B2, the standalone unit becomes an uninterruptable power supply.



D1,D2	SCHOTTKY DIODE, 175BGQ030 OR 182NQ030 BY INTERNATIONAL RECTIFER
R1	POWER RESISTOR 1R3 (1.3 OHM, 35 WATTS)
R2	POWER RESISTOR 1R65 (1.65 OHM, 35 WATTS)
R	STATIC LOAD RESISTOR, 200 OHM

Fig. 2: DC Schematic Showing Internal Battery and Load Connections

The batteries are always internally connected to the load, so on a loss of AC power there is no mechanical switching which takes place. As the AC power fails, the output voltage of the PSM drops slightly until it matches the battery voltage, at which time the batteries take over the role of providing current to the load. The system can be expanded to provide any amount of backup power. The only practical consideration is that for each hour of backup power provided at full load (50 amps), 5 to 6 hours of recharging time will be needed.

Note that in this configuration, battery charging can consume 8 amps of the 50 amps generated by the power supply leaving only 42 amps available for the load. Keep this in mind when sizing the system.

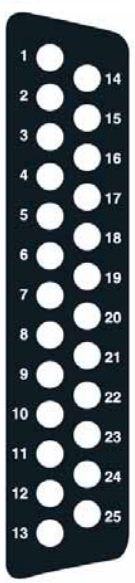
Cooling Fan Operation

Heat generated due to internal power dissipation is removed by forced cooling through two high power D.C. fans mounted at the back of the unit. These fans force outside air into the unit, where it travels across the internal components and then out through the vent holes provided on the two sides of the unit. It is extremely important that the suction side fanopennings and the discharge side vent holes are not blocked.

A warning circuit monitors the operational condition of the fans. In case of fan failure a buzzer will sound and in systems where the Interface option is implemented, the 'TEMP-FAIL' reading will be shown on the Status Screen. The unit should be switched off immediately and the defective fan should be replaced. Never load the unit when there is a TEMP-FAIL status or the buzzer is on.

25 pin D-Connector Features

There is a 25 pin D-sub connector for remote monitoring and indication. If the Interface Option was chosen, this connector is not available for other uses. Pin connections are given below:



PIN	Wire Color	FUNCTION (Signal type)
2	Black	- AC (5VAC 0.25A)
16	White	+ AC (5VAC 0.25A)
12	Orange	+ Fan/Temperature Fault (LED)
19	Green	- Fan/Temperature Fault (LED)
7	Grey	+ PCB 1 PSM Status (LED)
20	Violet	- PCB 1 PSM Status (LED)
8	Violet	+ PCB 2 PSM Status (LED)
21	Blue	- PCB 2 PSM Status (LED)
9	Blue	+ PCB 3 PSM Status (LED)
22	Green	- PCB 3 PSM Status (LED)
10	Green	+ PCB 4 PSM Status (LED)
23	Yellow	- PCB 4 PSM Status (LED)
11	Green	+ PCB 5 PSM Status (LED)
24	Yellow	- PCB 5 PSM Status (LED)
13	Black	- DC Output (24VDC 0.25A)
25	Red	+ DC Output (24VDC 0.25A)

Fig. 3: 25 Pin D-Connector Pinout

Multiple Unit Features

48 VDC Systems

The output of two standalone systems can be wired in series to achieve a 48 volt (54.6 VDC +/- 1%) power supply. This is a common configuration used in wireless and other communication systems.

100 Amp Systems

The output of two standalone systems can be wired in parallel to achieve a 24 volt (27.6 VDC +/- 1%) 100 Amp power supply. Additional supplies can be paralleled to achieve 150 Amp, 200 Amp, 250 Amp supplies, and so forth.

Interface Option

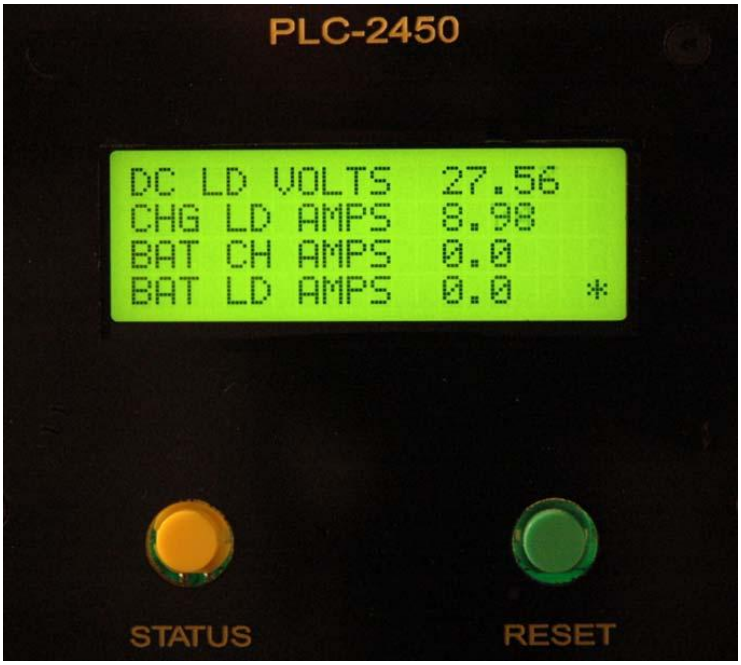


Fig 4: Interface Unit with MAIN SCREEN shown

DC LD VOLTS	- the voltage applied to the load
CHG LD AMPS	- the current the load is using
BAT CH AMPS	- the current used to charge the batteries
BAT LD AMPS	- the current from the batteries to the load

The * is the heartbeat indicating program is running

STATUS pushbutton will move to the alarm and relay status screen (will move to the DC Low Volts SetPT screen from the status screen)

RESET pushbutton will reset alarms when fault condition clears when pushed from the main screen or the status screen

Fig 5: STATUS SCREEN

AC	– AC circuit feeding the charger either OK or FAIL
DC	– DC volts is above the Low Voltage Setpoint either OK or FAIL
CHRG	– Charger is running and carrying the load either OK or FAIL
TEMP	– Charger cooling fans are running either OK or FAIL
PCB	– Status of the 5 Power Control Modules 1=OK, 0=FAULT
Relays	– Alarm relays are on=1 or off=0

Note: The PCB's are internally interconnected to monitor the output voltage of each module, and share the load. The deviation is .5 VDC, and is factory set. It is not uncommon to see the status of one or more modules change from 1 to 0 under small load conditions. Each PCB can deliver 10 amps of current. If a PCB remains at 0 under near full load conditions (50A), contact technical support for assistance.

Alarm relays are set to be either latching (LT-Y) as shown in Fig 5, or non-latching (LT-N). Pressing the STATUS button while on the STATUS SCREEN will cycle between the settings LT-Y and LT-N. If no buttons are pressed, the STATUS SCREEN will be displayed for approximately 15 seconds and then return to the MAIN screen.

When set up in LT-Y (latching) mode, alarms are reset by pushing the green RESET pushbutton.

To move to the DC LOW Volts SetPT screen, press and hold down the green RESET button and then press the yellow STATUS pushbutton.

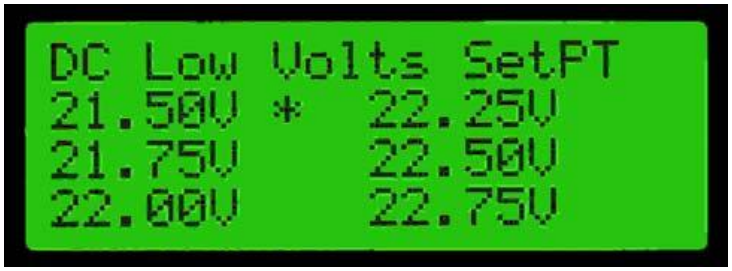


Fig 6: DC Low Volts SetPT SCREEN

To select the DC Low Volts setpoint, press the yellow STATUS pushbutton to cycle through the preset voltages. The * indicates the selected voltage. When the desired voltage setpoint is selected, press the green RESET pushbutton to store the setting to eeprom and return to the MAIN screen. If the RESET pushbutton is not pressed, the selection will not be stored. This screen will automatically return to the MAIN screen in approximately 10 seconds if the RESET pushbutton is not pressed.

Default setpoint is 21.50 V

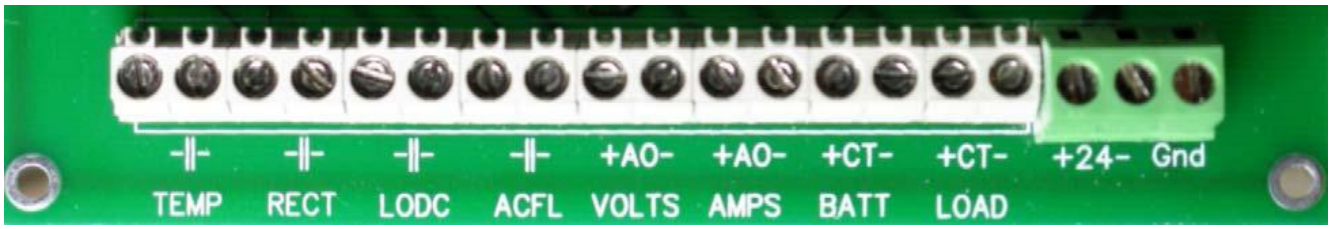


Fig 7: Wiring Connections

TEMP/FAN	- N.O. contact .5A 24VDC
RECT	- N.O. contact .5A 24VDC
LODC	- N.O. contact .5A 24VDC
ACFL	- N.O. contact .5A 24VDC
BATT CT	- Current transmitter for Battery current
LOAD CT	- Current transmitter for Load current
VOLTS AO	- Optional analog output (**AO**)* 4-20ma scaled 0-30V
AMPS AO	- Optional analog output (**AO**)* load current 4-20ma scaled 0-50A

Notes: - The analog outputs are active type
- Refer to drawings for panel and field wiring details
- **<u>*DO NOT APPLY POWER TO THE ANALOG OUTPUT (AO) TERMINALS</u>**

Specifications – Standalone Unit

No. of modules	5
Input voltage range	105 to 125 V AC, 60 Hz
Output voltage	27.5 V DC
Output regulation	1%
Output current	Continuous 50 A
	Surge 55 A
Output current limited	66 A
Output ripple	60 mv
Output noise	Up to 600 mv
Cooling	forced air, 2 fans
Operating temperature	0 to 40 C
Protections	Short circuit Yes
	Fan failure buzzer
	Input surges Suppression Yes
	Fuse Module fuse- 125 V 4 A
Dimensions	19” x 14” x 3.6 “
Weight	23 LBS

Specifications – Interface Option

Input voltage	24 VDC
Input current - fused	500mA
Input current - nominal	< 200mA
Dimensions	< 8” x 6” x 2”
Weight	< 0.7 LB

Troubleshooting

POWER ON/OFF SWITCH DOES NOT LIGHT WHEN SWITCHED ON

1. Check that power is available in the AC outlet or AC input terminals or that the power cord is properly plugged in.

POWER SWITCH TRIPS

1. The breaker, which is a part of the power on/off switch, has tripped due to an abnormal condition. Reset (ie turn on) the switch. If tripping persists call technical support.

"TEMP. FAULT" BUZZER IS SOUNDED

1. One or both of the fans have stopped. Forced cooling has failed due to defect in the cooling fan(s). Switch off the unit immediately . Fan(s) needs to be replaced.
DO NOT USE THE UNIT TILL THE DEFECT IS RECTIFIED. IT IS PROHIBITED TO USE THE UNIT WITHOUT FORCED COOLING. Call technical support.
2. If both the fans are running, the small fan status monitoring PCB may be defective. Call technical support.

"PCB STATUS"

1. The status is '0'. The associated module has become defective. The unit will still operate normally as the remaining working modules will share a higher load. The unit will go into current limit and the output voltage will drop if the load drawn is more than the combined maximum rated output of the remaining modules. Reduce the load so that the maximum load drawn is less than the combined maximum rated output of the working modules. Remove the defective module and replace with a new module.
2. ONE OR MORE "PCB STATUS" indicators "FLASH" (alternates from '1' to '0'). The output voltage of the individual modules is not the same or the forced shared control circuitry of the module(s) is defective. Adjust the voltages of the modules to a common voltage as explained on page 13 Output Voltage Adjustment for a New or Existing Module. If the problem still exists, contact technical support.

OUTPUT VOLTAGE DROPS

1. The unit has gone into current limit as the load being drawn is more than the combined maximum rating of the working modules. This may also result if one or more modules has failed . Check that all the modules are operating properly. Reduce the load drawn to a value less than the combined maximum rated output of the working modules. If the voltage does not rise to the rated voltage of 27.6 V, then switch off all the loads. If the voltage in this condition is also low, switch off the unit and contact technical support.

Limiting Electromagnetic Interference (EMI)

1. Switched mode power supplies (SMPS) employ high frequency switching and thus, are a source of radio interference, a recipient of radio interference and a conduit of radio interference. (Older linear type transformer based power supplies do not employ high frequency switching voltages and will be quieter as compared to switching type supplies).

2. The primary emission sources originate in the switching devices due to their fast switching current transitions: harmonics of the switching frequency and broadband noise created by under-damped oscillations in the switching circuit. The secondary source is from the bridge rectifier, both rectifier noise and diode recovery. The AC input rectifier / capacitor in the front end of the switching power supplies (excepting those with power factor correction) are notorious for generating power supply harmonics due to the non linear input current waveform. The noise is both conducted and radiated through the input power cord and the DC output wiring to the radio. Filters are used to limit the noise to acceptable level.

3. Switching power supplies are also recipients of radio interference. The normal operation of the power supply can be disturbed due to RF noise getting coupled into the power supply. Thus, the power supply may generate excessive RF noise and lose output voltage regulation due to excessive transmitter energy being coupled through the AC / DC lines to the power supply's regulator feedback path. This may be due to antenna being too close or due to the antenna or feed system not radiating properly. First check the antenna system SWR. Then, if necessary, relocate either the antenna or the power supply farther apart.

4. The receiver may "hear" the power supply. A slowly moving, slightly buzzing carrier heard in the receiver may be caused by the antenna being too close. As with the transmitter related noise pick up, a loose coaxial connector or a broken or a missing ground may aggravate this problem. Normally these noises will be below the background or "band" noise. Increase the separation between the power supply and the receiving antenna. Use an outdoor antenna. This will reduce the amount of signal picked up from the power supply and also increase the amount of the desired signal.

5. The conducted RF noise from these power supplies is limited to the maximum allowable levels by internal filtration. The filtered RF noise currents are bypassed to the chassis of the power supply. The chassis is, in turn connected to the earth ground pin of the AC input power cord (for Class 1 units). Thus, the filtered noise currents are intentionally leaked to the earth ground. This is termed as the "Earth Leakage Current". For safety against electric shock, this earth leakage current is also required to be limited. It will be seen that these two requirements are conflicting.

NOTE: In some cases, to prevent electric shock hazard due to abnormal leakage current (like in marinas, spas, hot tubs, wet spaces etc.), the AC outlet circuits / receptacles in these areas

are served through a GFCI (Ground Fault Circuit Interrupter). This GFCI is normally set to trip when it senses an earth leakage current > 5 mA. A single GFCI may be serving multiple AC outlet circuits / receptacles and therefore, will be sensing the sum of all the leakage currents of the devices connected to these. As the switching power supplies have intentional leakage current as explained above, it may trip a GFCI feeding multiple AC outlet circuits / receptacles. In such cases, disconnect devices connected to the other AC outlet circuits / receptacles served by this GFCI.

6. Following additional guidelines may be followed to reduce the effects of RF noise:

a. Use additional appropriate AC radio frequency interference (RFI) power line filter immediately before the ac input of the power supply. Recommended: Corcom Inc. (www.cor.com) “Q” series. Filtered, ferrite coated cord set (www.emceupen.com) is another choice. These cord sets, with integral line interference filters, reduce common and differential mode interferences over a wide frequency range. Because they are shielded, they are also effective against radiated interferences. In addition to the built-in filter networks, the cable conductors are coated with an RF absorbing ferrite compound. This provides additional attenuation at high frequencies that is lacking in most regular LC filters. The RF absorption of the ferrite-coated cable avoids resonance’s at high frequencies, reducing the conducted and radiated RF noises even further.

b. Use additional appropriate DC radio frequency interference (RFI) power line filter immediately after the dc output of the power supply. Recommended: Corcom Inc.(www.cor.com) “DA” / “DC” series.

c. Twist the positive and negative wires from the output of the power supply to the radio.

d. The DC side positive and negative outputs of these power supplies are isolated from the chassis. As explained at paragraph 5 above, the noise currents are filtered to the chassis ground and the chassis ground is connected to the earth ground through the earth ground pin of the AC power outlet receptacle. Avoid connecting (referencing) the DC negative output terminal of the power supply to the earth ground.

e. Connect a 1/4 wave length of wire on the negative terminal of the power supply. Connect one end of the wire to the negative terminal and leave the other end free. The wave length corresponds to the wave length of the interfering frequency. (May not be practical for long wave lengths)

Formula: Wave length (Meters) = 300 / frequency in MHz

LIMITED WARRANTY

The equipment manufacturing for Prologic Controls ltd. (The “Warrantor”) is warranted to be free from defects is workmanship and materials under normal use and services. This warranty is in effect for 1 year from the date of purchase by the used and service. The warranty is in effect for 1 year from the date of purchase by the user (The “Purchaser”)

In case any part of the equipment proves the defective; the purchaser should do the following:

-Prepare a written statement illustrating the nature of the defect to the best of the Purchaser’s knowledge, and include the date of purchase, the place of purchase, and the Purchaser’s Name, address, and telephone number.

-Call Prologic Controls Ltd. 1(403)250-2909 or Fax 1(403)291-4949 and request a returning merchandise authorization number (RMA)

-Return the defective part or unit along with the statement (at the Purchaser’s expense) to the Warrantor: Prologic Controls Ltd. 2318 18th Ave NE Calgary, AB T2E 8R1 Canada. The RMA number must be marked clearly on the outside of the packaging. Make sure the following is attached:

Original Bill of Sale
Date Purchased
Place of purchase
Purchase price
Serial number

If upon the Warrantor’s examination the defect proves to be a result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor’s option without charge, and returned to the Purchaser at the Warrantor’s expense.
No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. Warranty services shall be performed only by the Warrantor. Any attempt to remedy the defect by anyone other than the Warrantor shall render this warranty void.

There shall be no warranty for defects or damage caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion.

No other express warranty is hereby given and there are no warranties which extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purpose for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of Warrantor or its employees and representatives. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representative for injury to any persons, or damage to person or persons, or damage to property, or loss of income or profit, or other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment. Including any possible failure of malfunction of the equipment, or part thereof.

The Warrantor assumes no liability for incidental or consequential damages for any kind.

R1.3 April 23, 2012 – Trecon Prologic Technical Support Tel: 403-250-2909 Fax: 403-291-4949